

GeoSpectrum

Picking Fractured Lower Dakota Gas Prospects Using Multiple Azimuth Seismic Attributes

U.S. Department of Energy Contract No. 40697

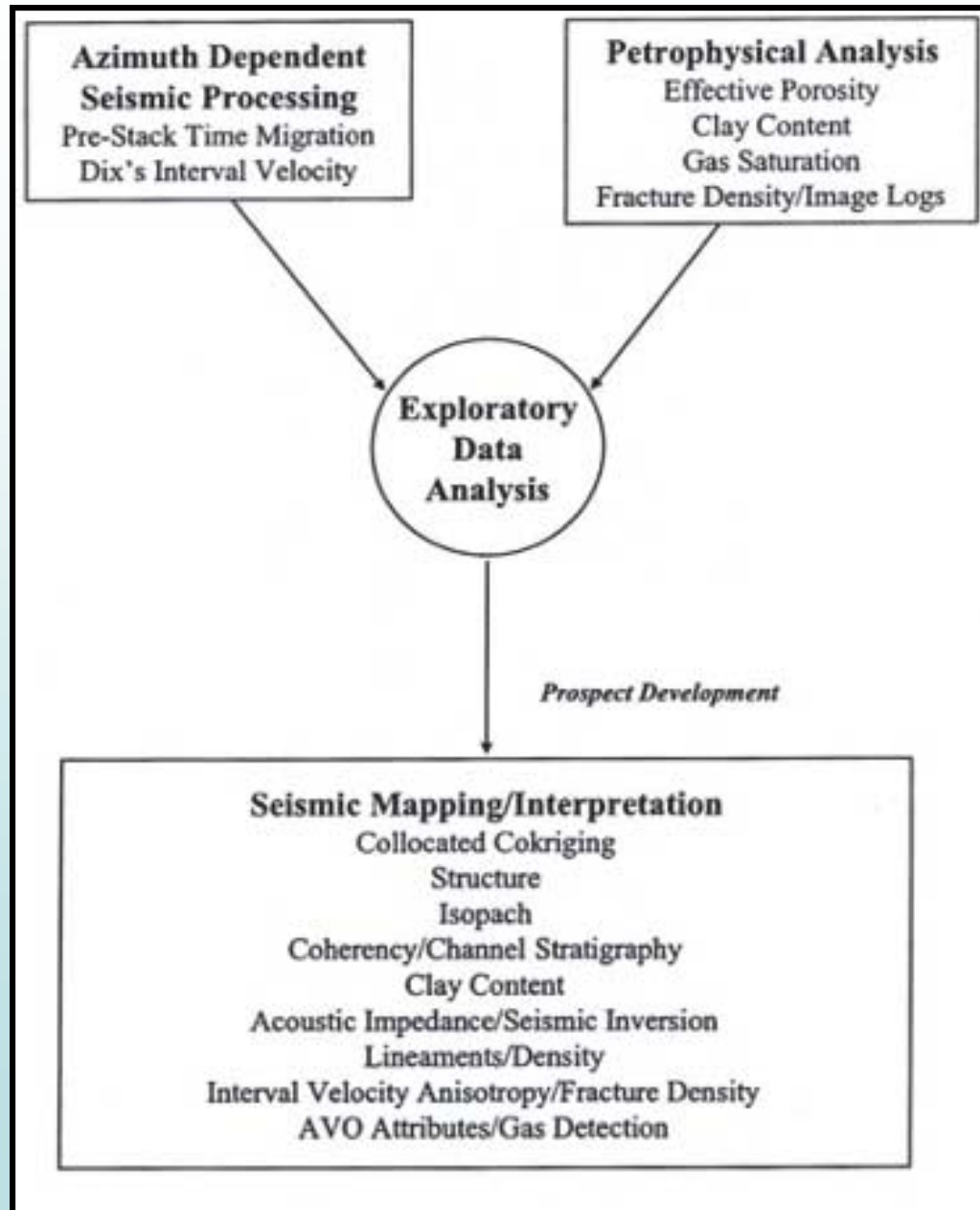
***Contractor:* GeoSpectrum, Inc., Midland, Texas**

***Industry Partner:* Burlington Resources, Farmington, New Mexico**

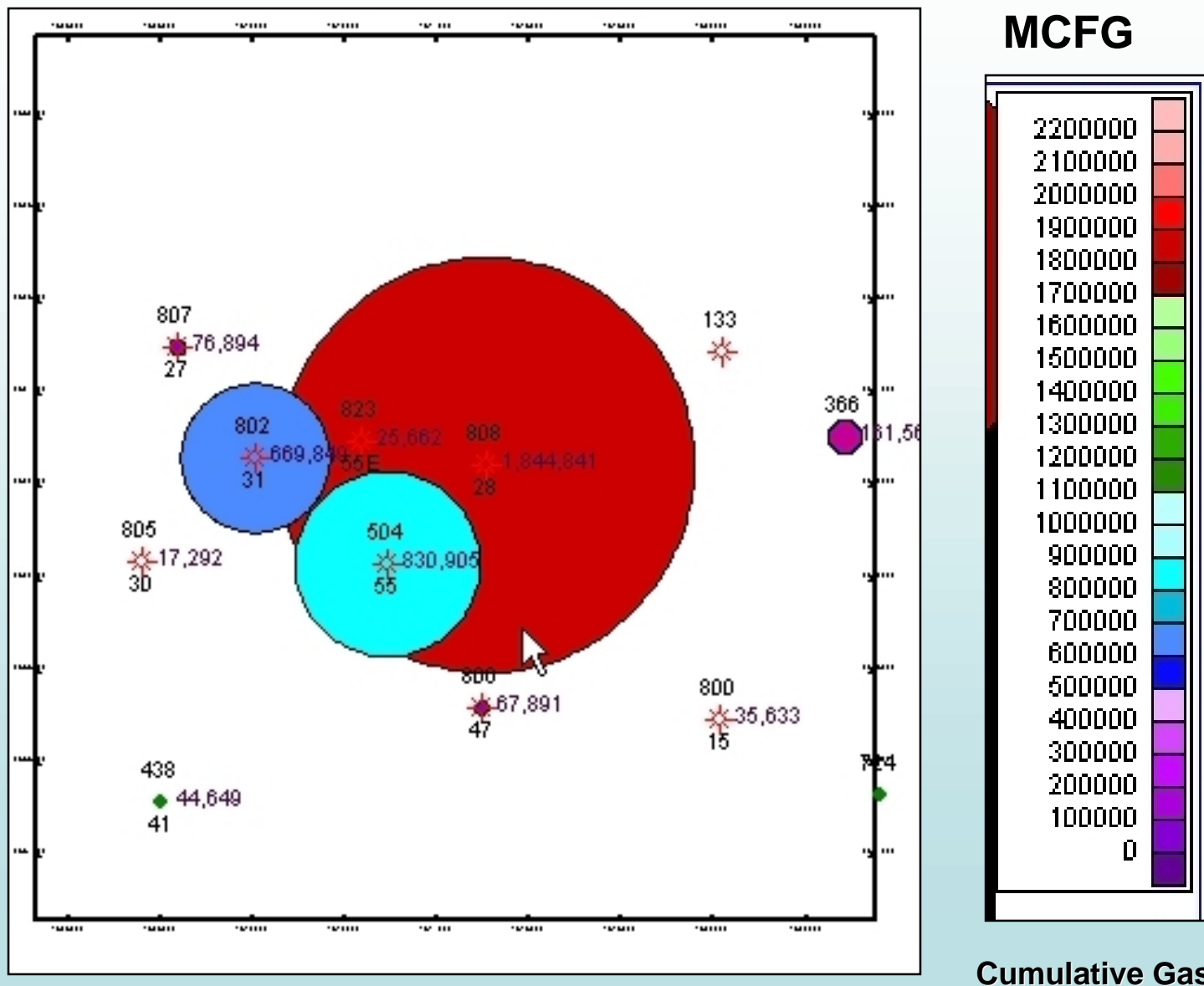
***Principal Investigator:* Dr. James J. Reeves, Ph.D., P.G., P.E.**

***Project Manager:* W. Hoxie Smith, M.S.**

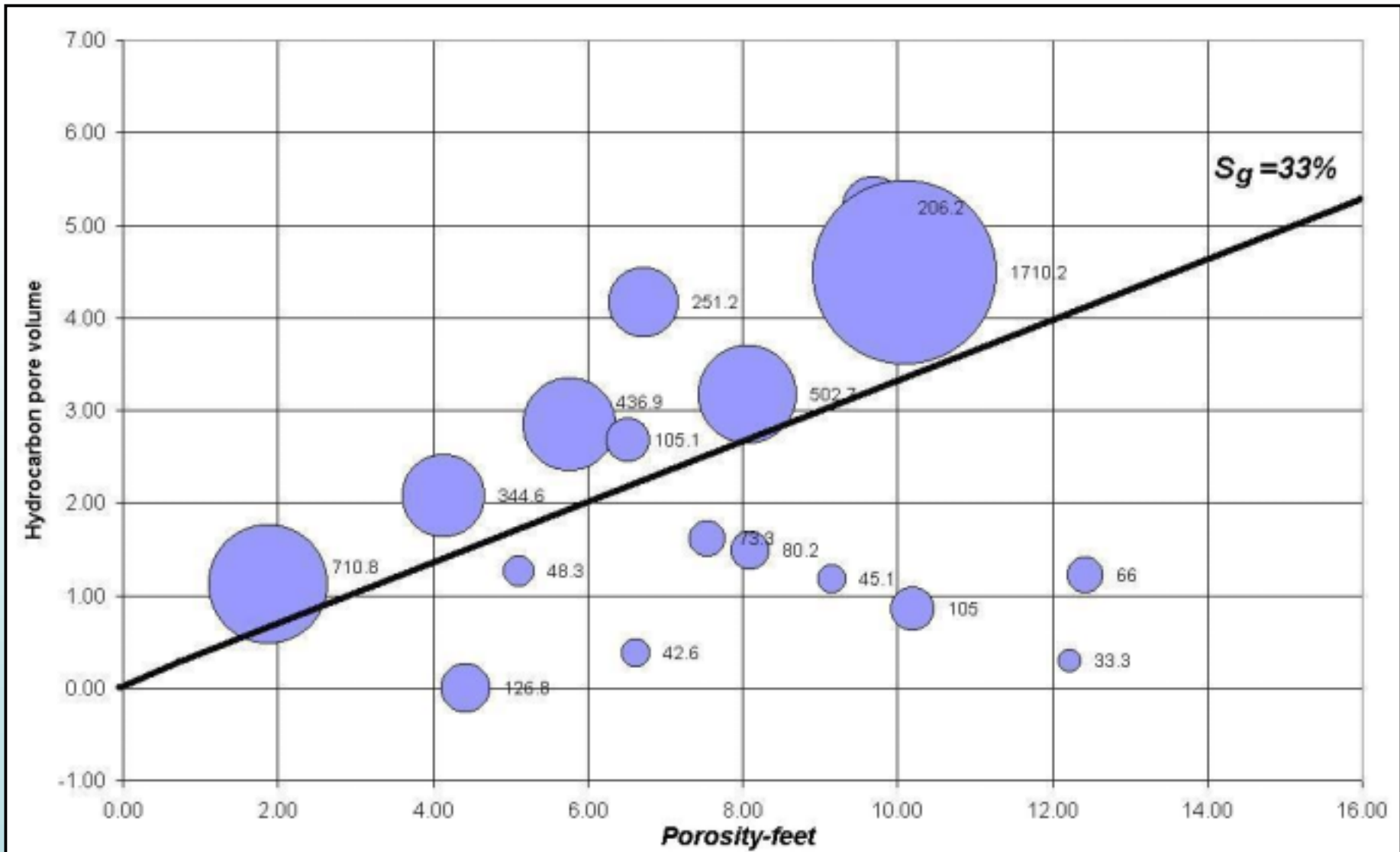
Prospect Development Methodology



Base Map / Dakota Gas Production

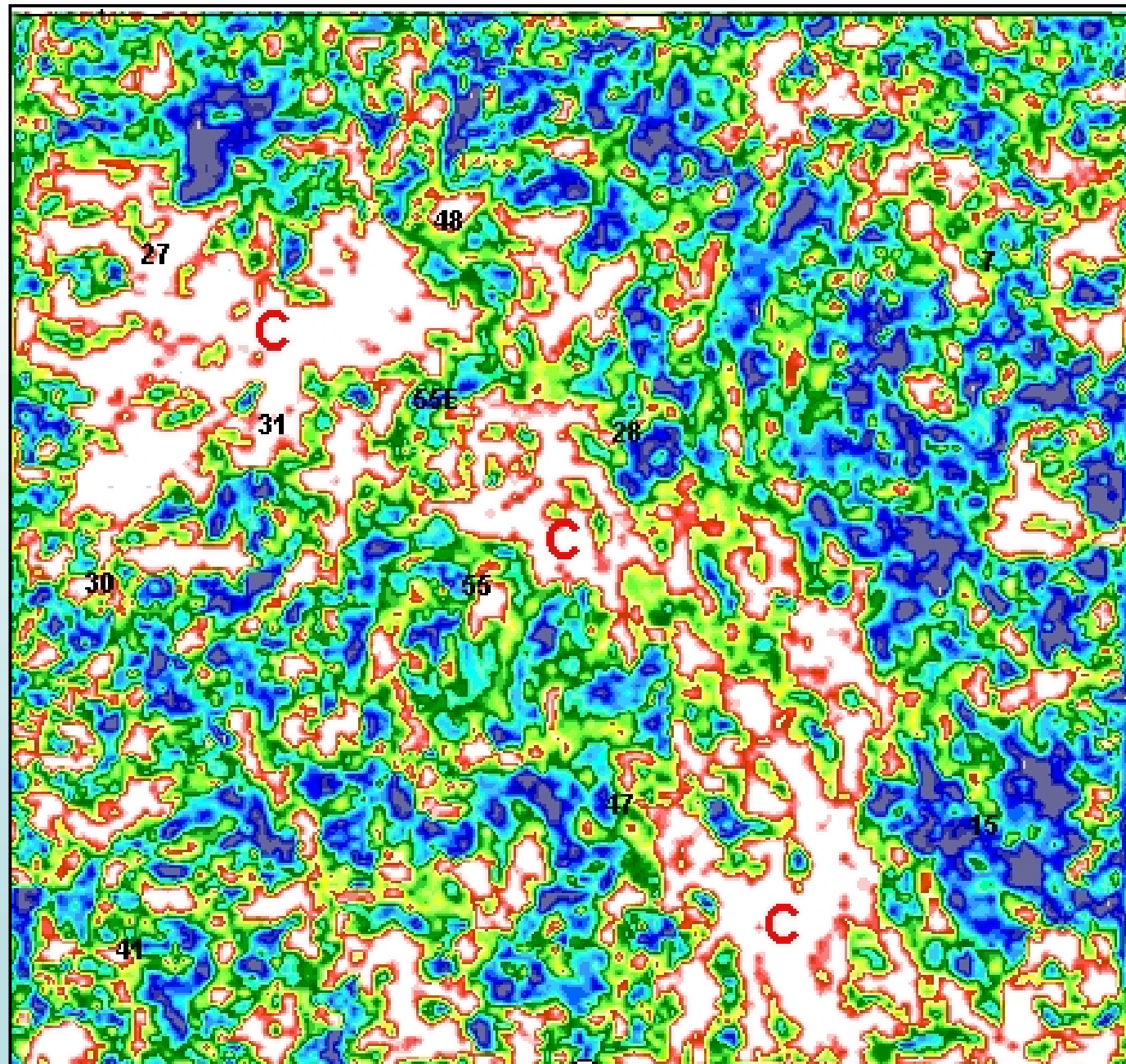


Hydrocarbon Pore Volume vs. Porosity-Thickness

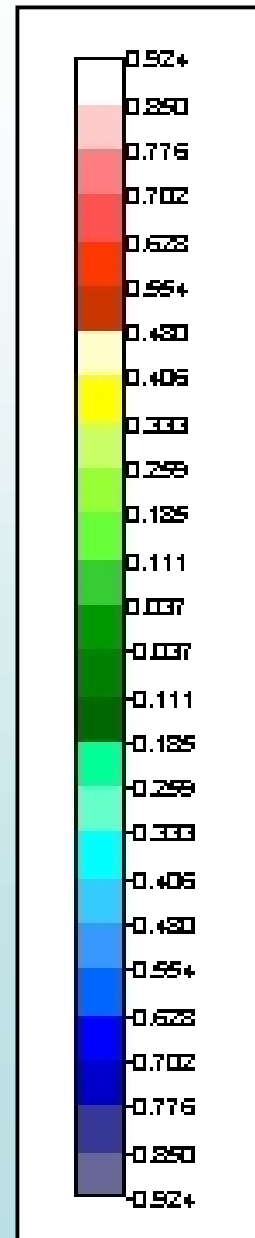


Bubble size is best 12-months production

Lower Dakota Seismic Coherency / Channel Stratigraphy

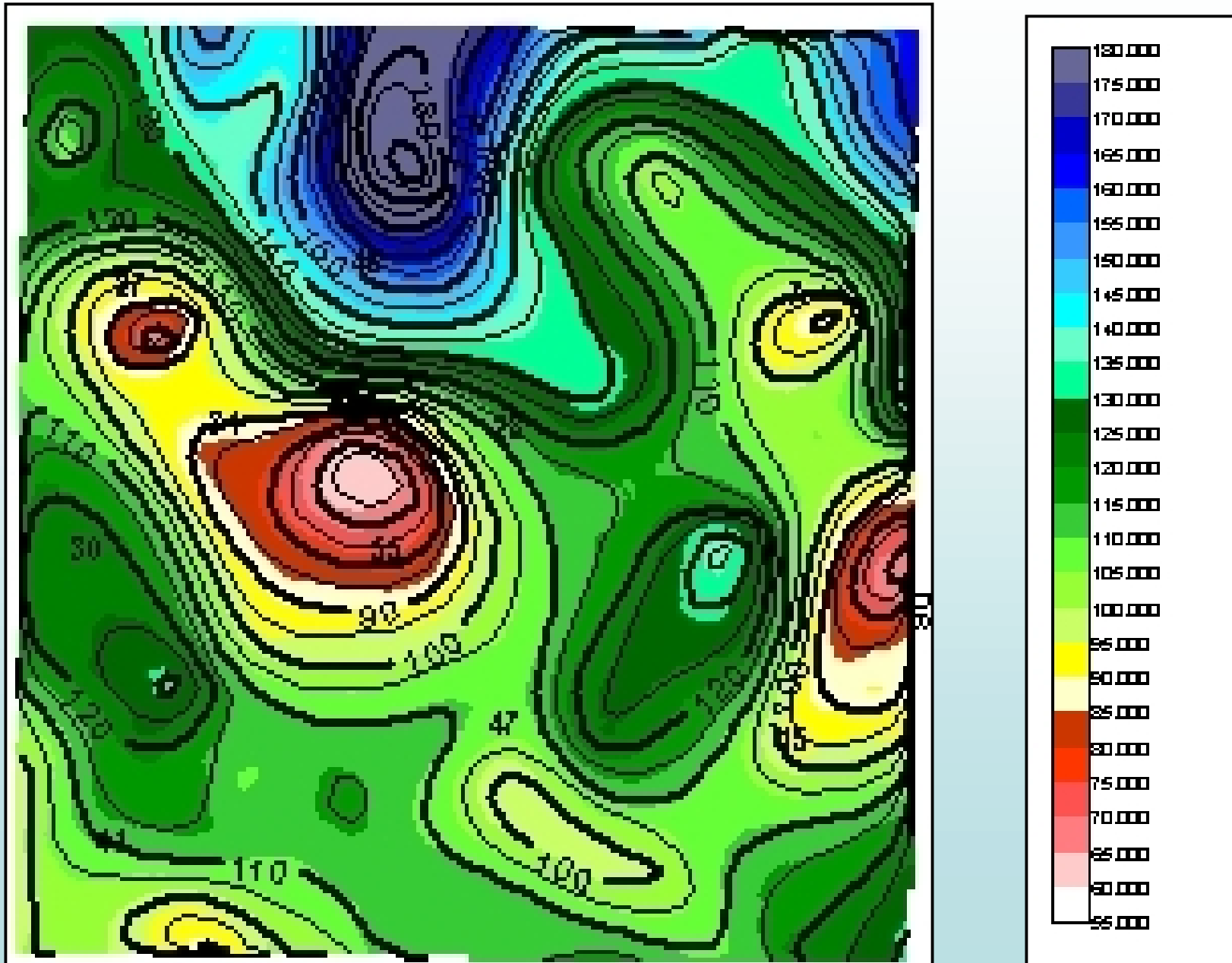


Coherency

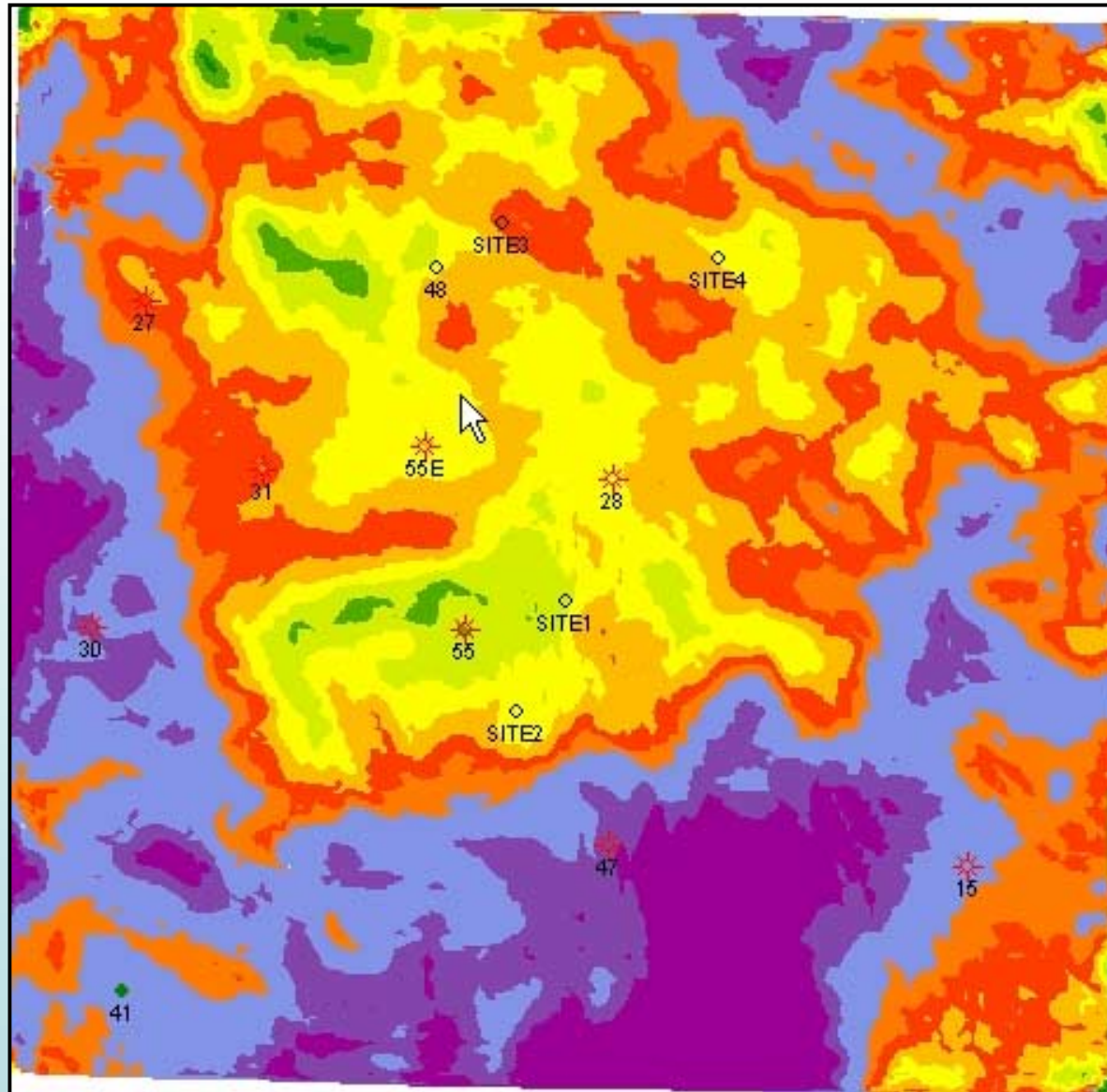


Lower Dakota Seismic Isopach

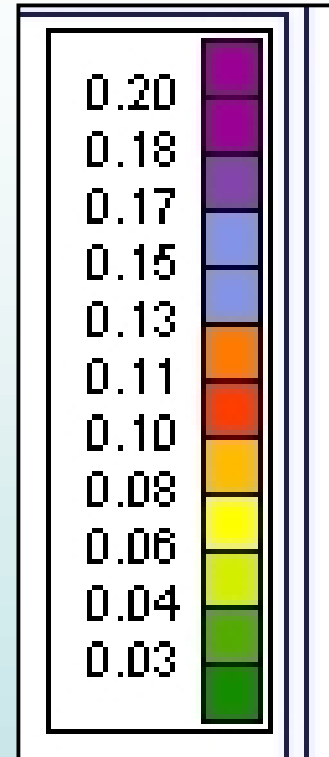
Thickness ft



Co-located Co-kriged Clay Volume



Percent Clay

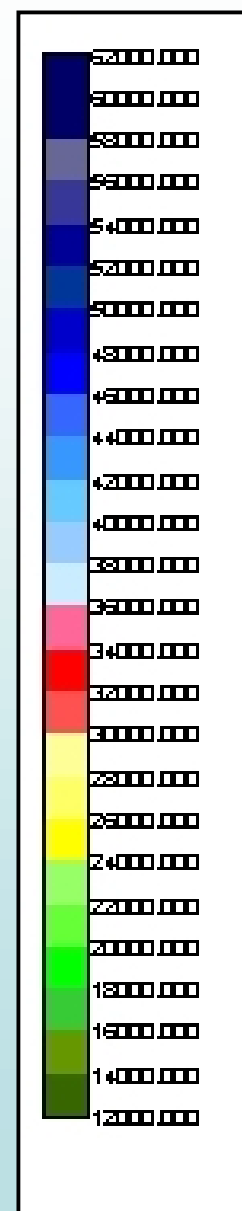
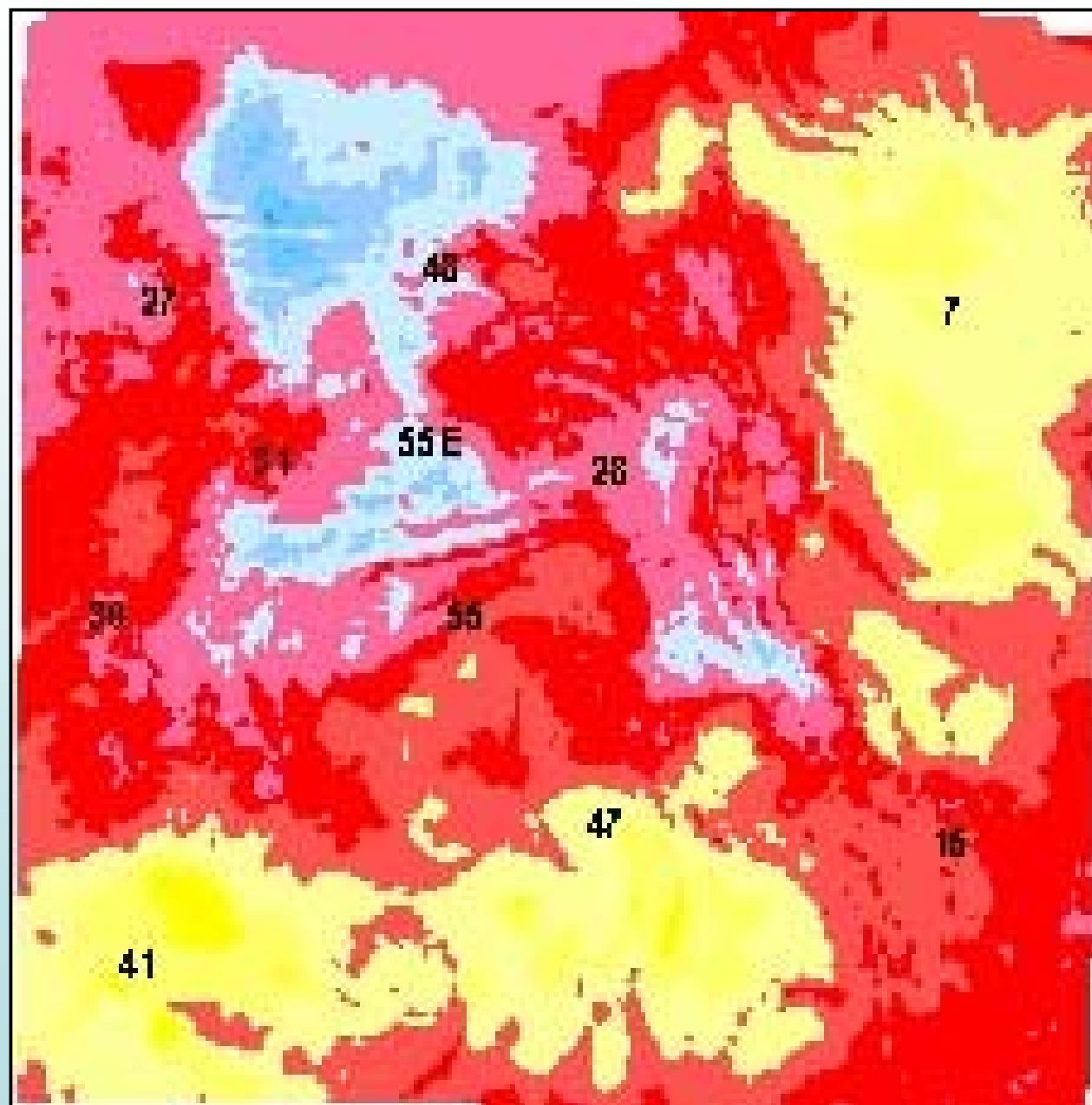


Near Trace Seismic Amplitude

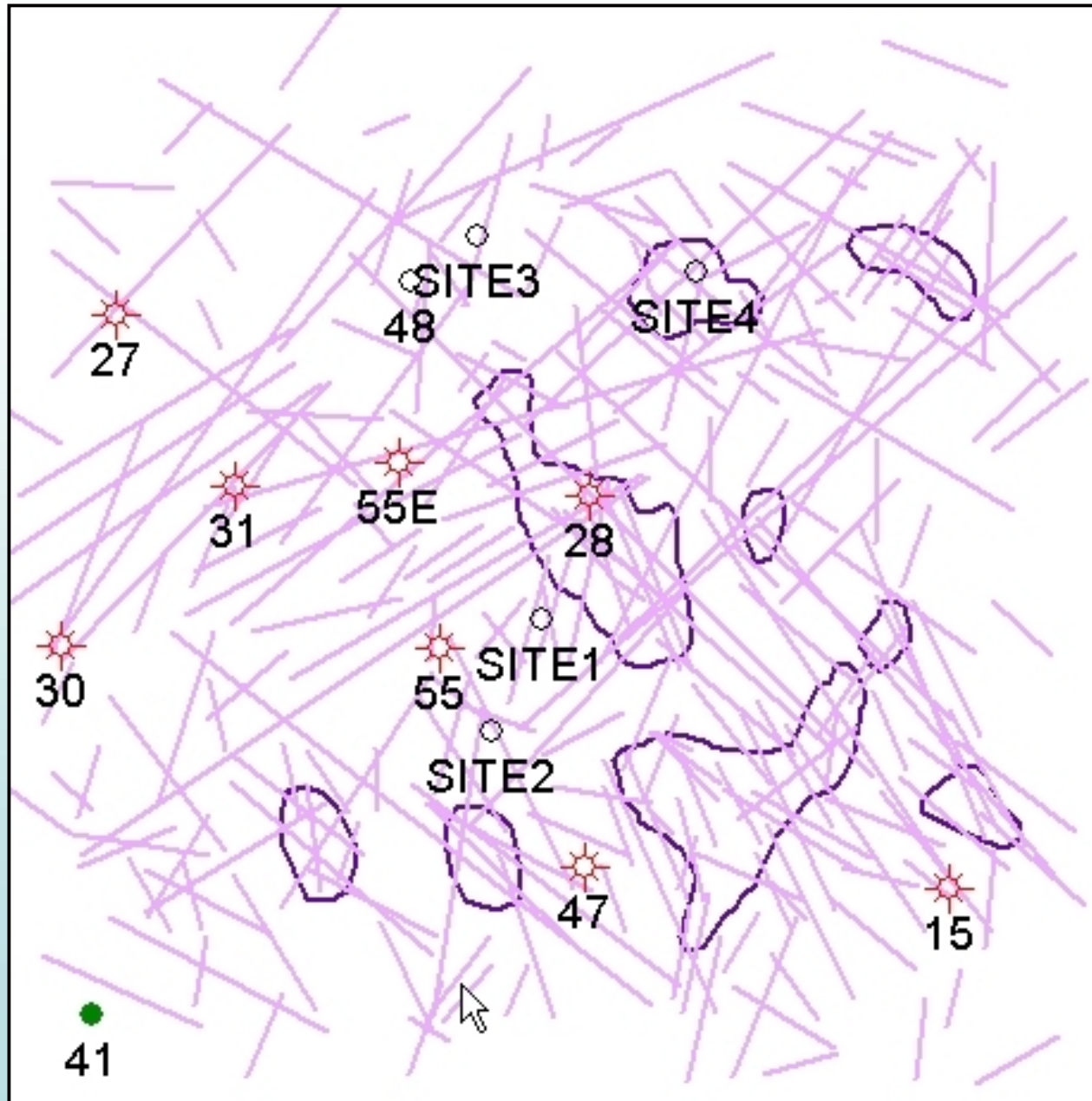
Lower Dakota Acoustic Impedance

AC IMP

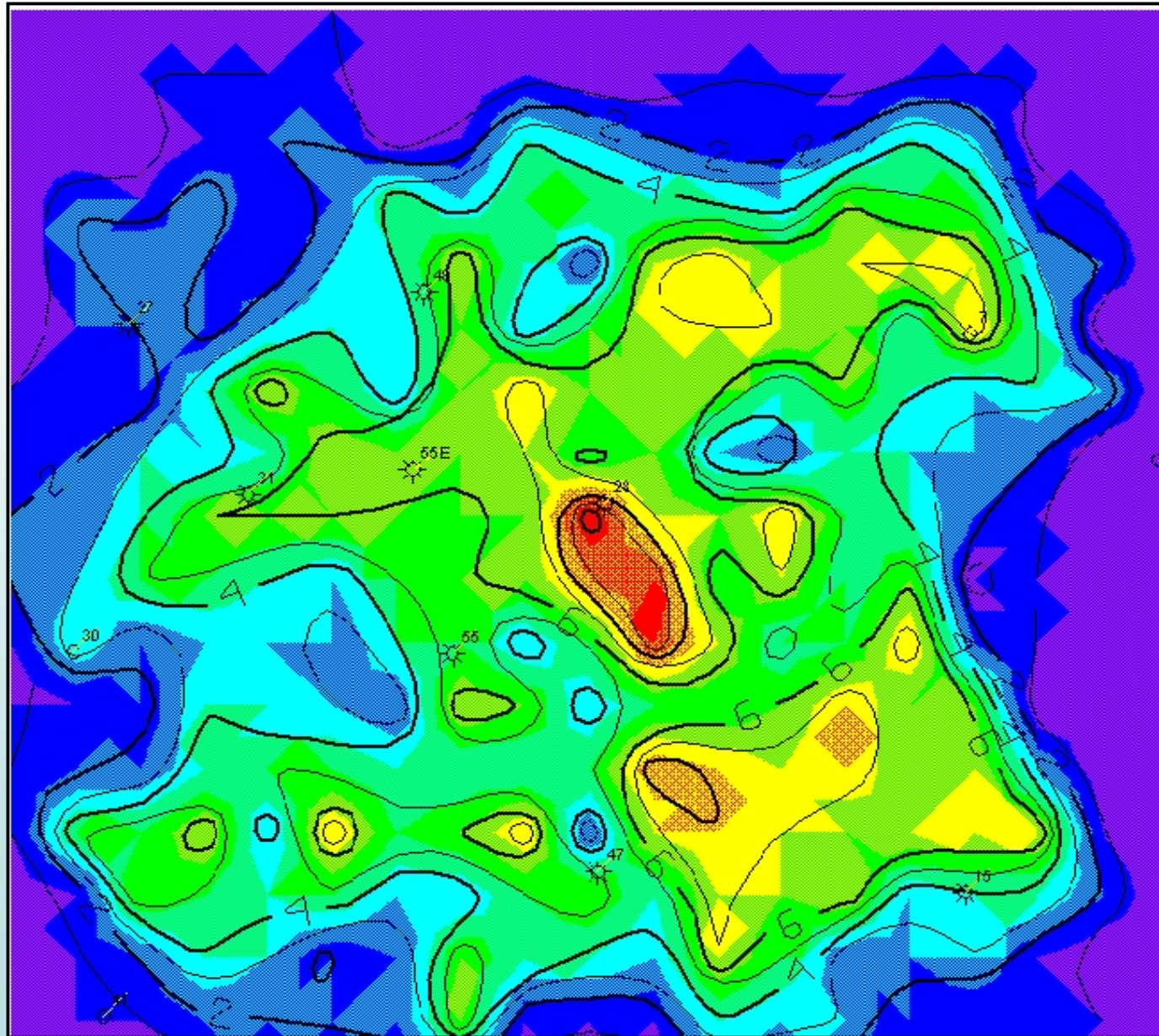
ft/ms-g/cc



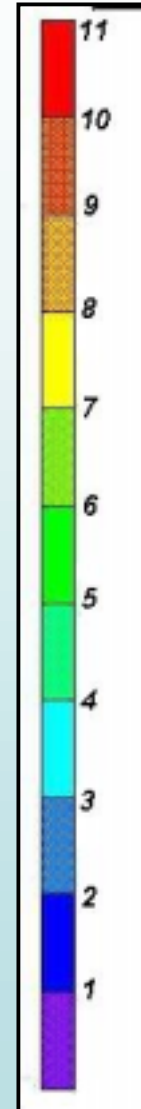
Lower Dakota Seismic Lineaments with Prospective Drill Sites



Lower Dakota Seismic Lineament Density

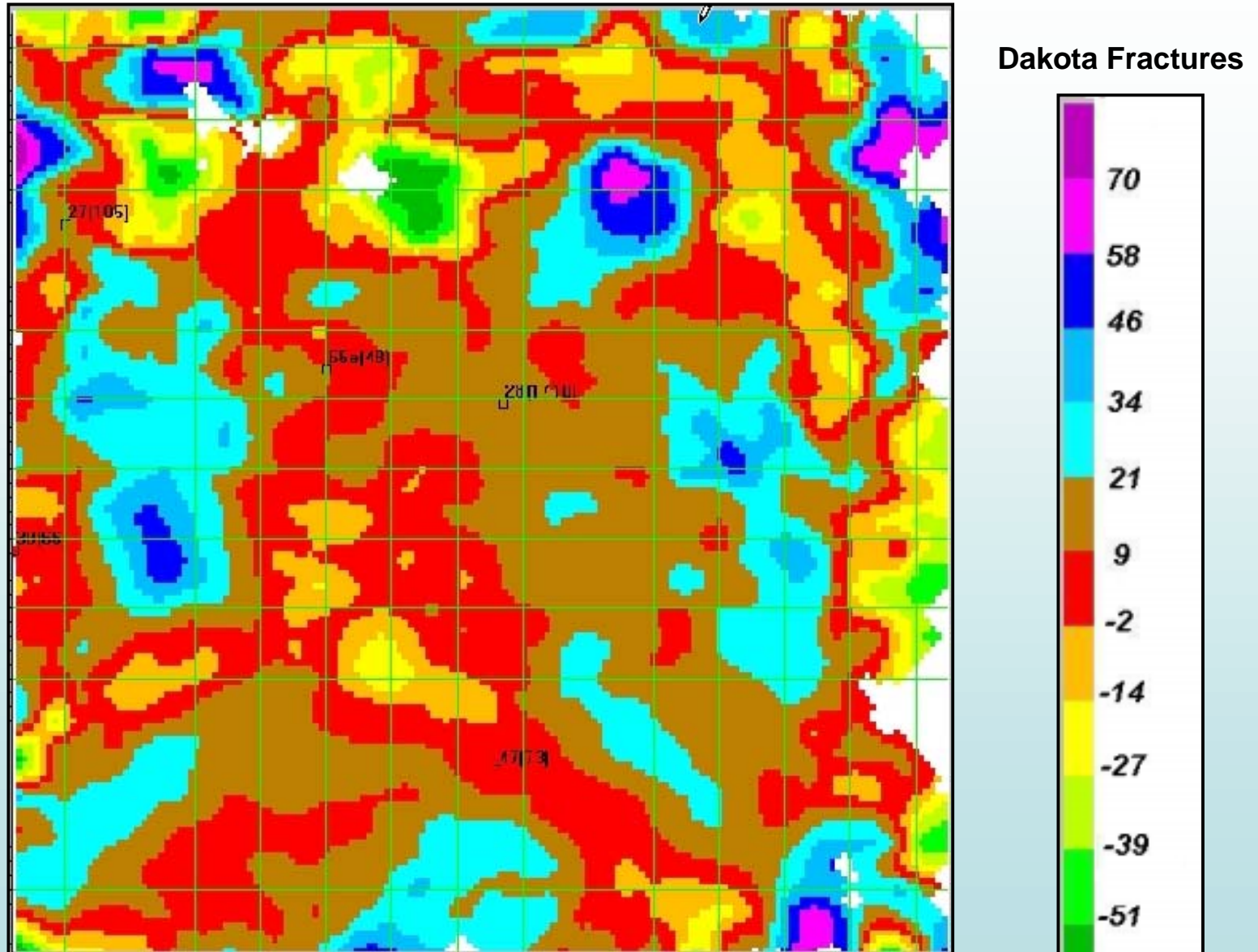


Lineaments
Per Grid



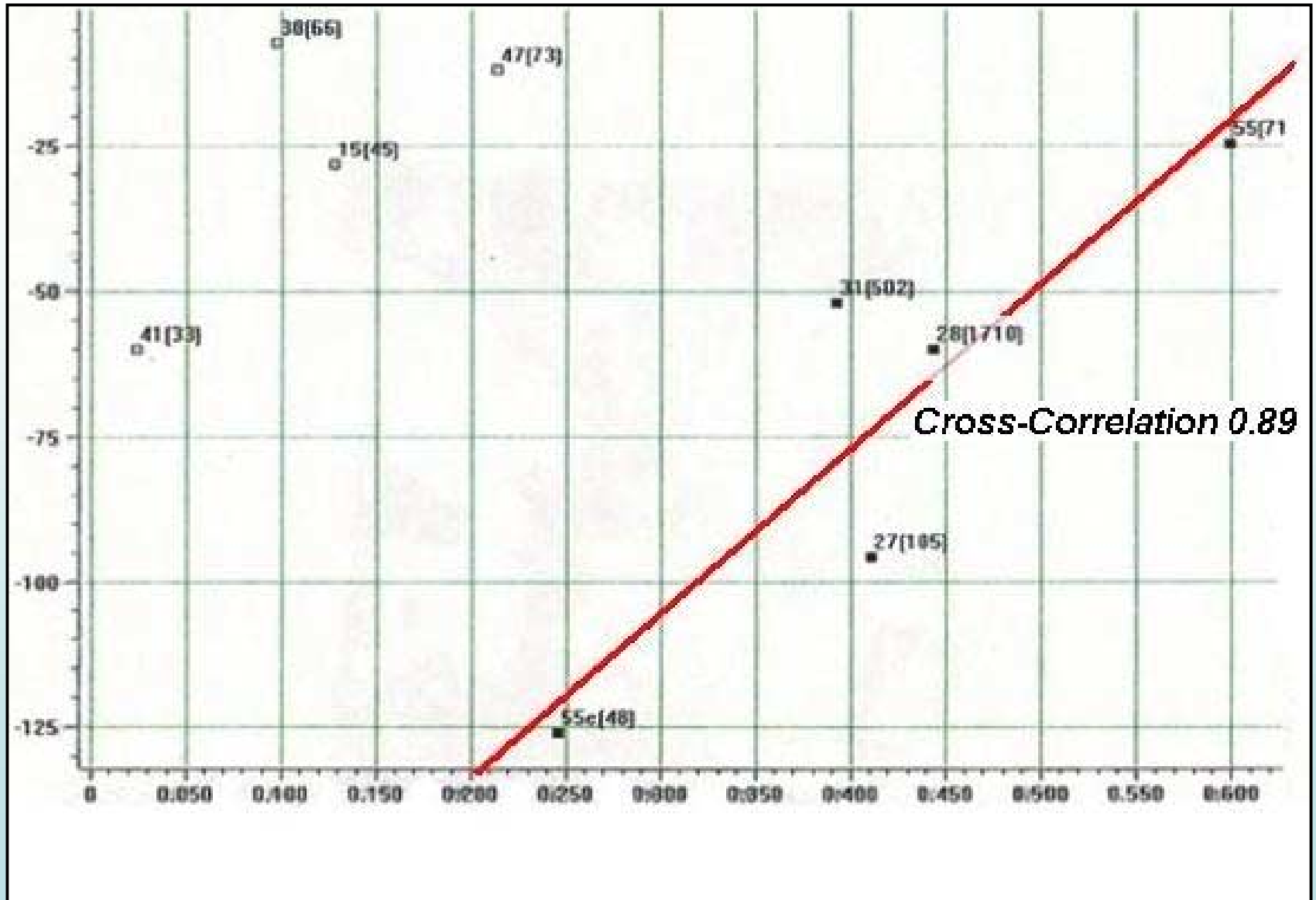
900x900 ft Grid

Co-located Co-kringed Dakota Fractures



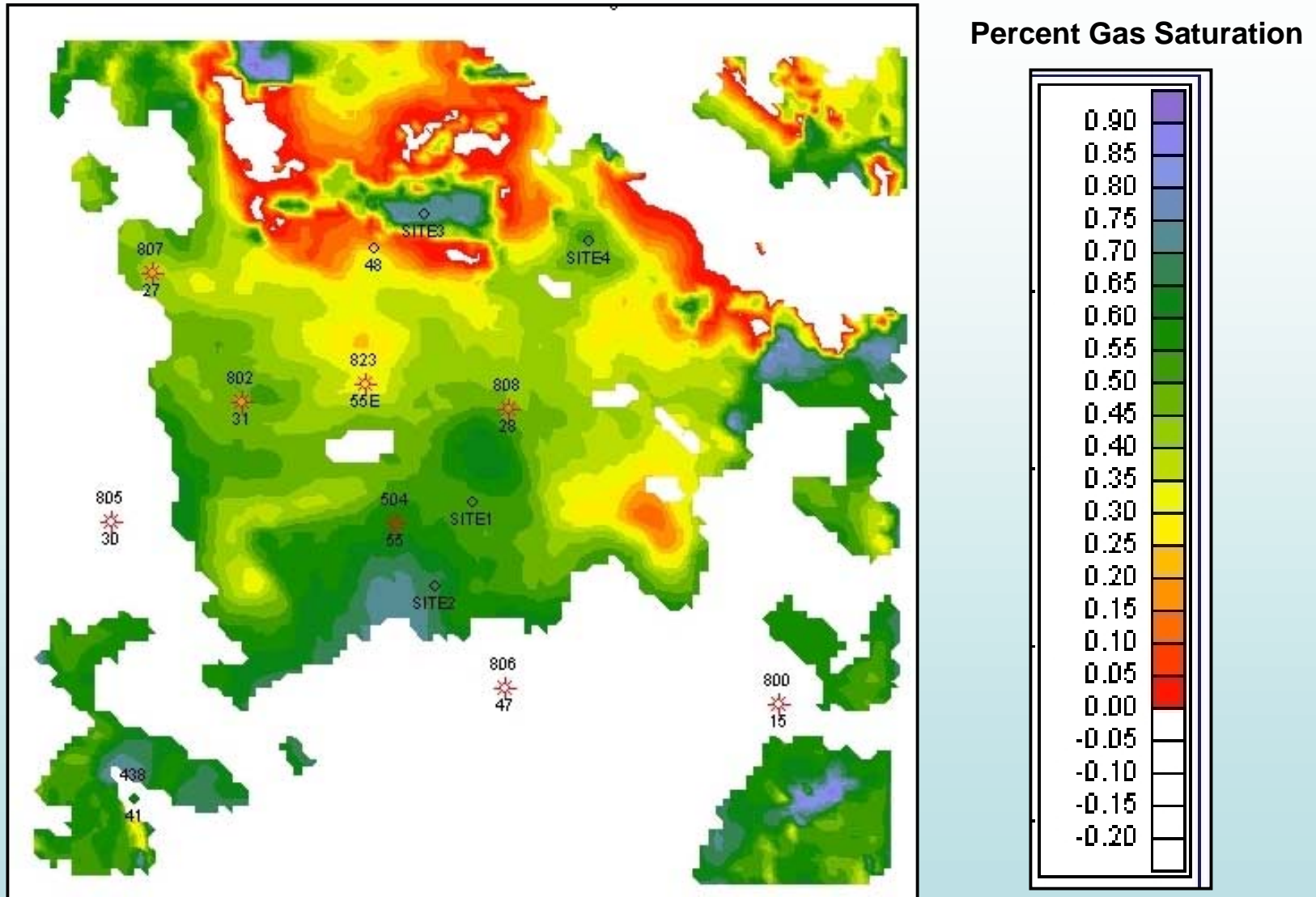
Azimuth Dependant Dix Interval Velocity Difference

Lower Dakota Phase Difference vs. Gas Saturation



Phase - Near Trace Minus Far Trace

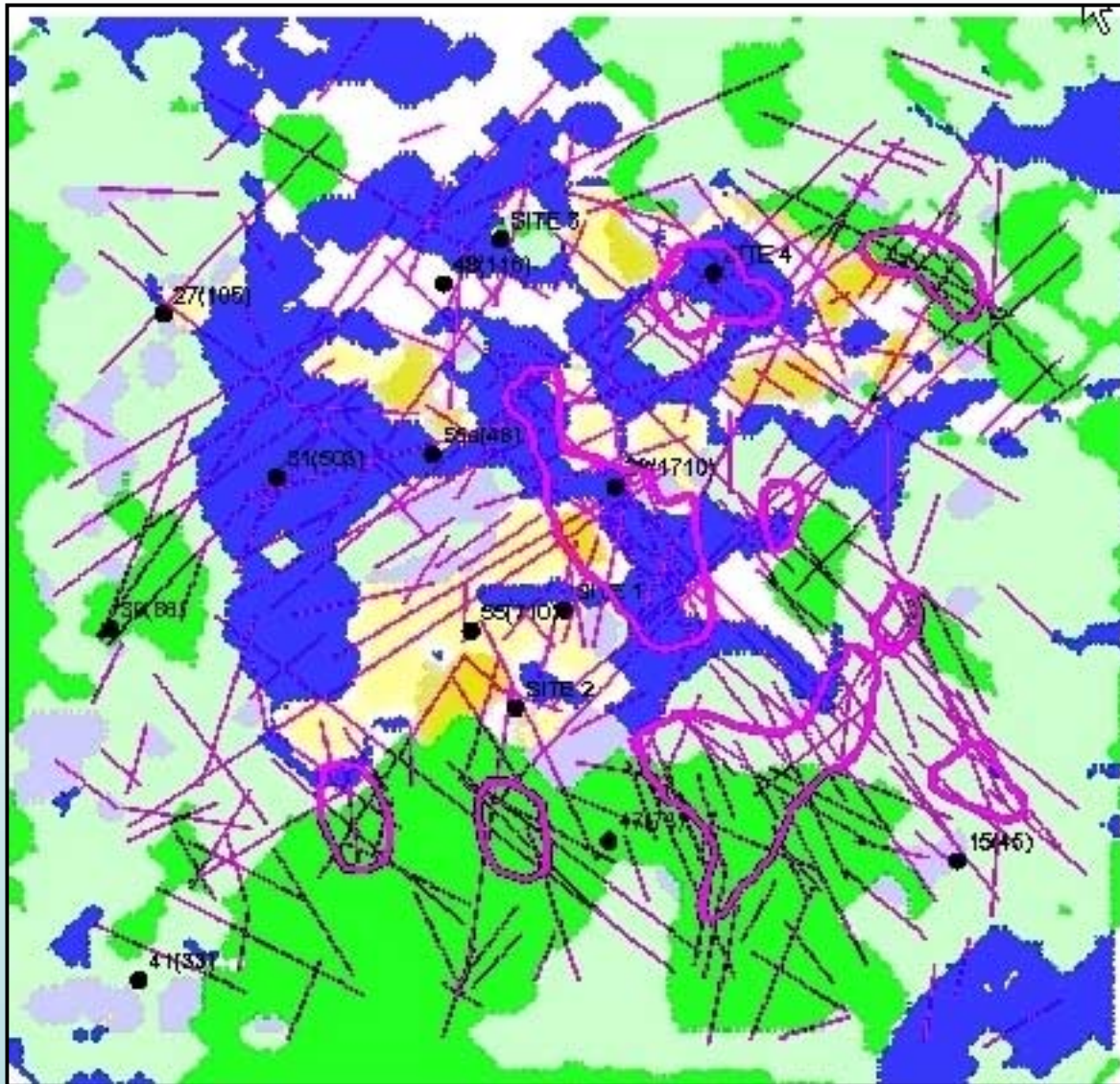
Co-located Co-kriged Lower Dakota Gas Saturation



Lower Dakota Seismic Phase Difference

Composite Map

Lower Dakota Reservoir Attributes



AREAS

BLUE.....gas, low clay, velocity anisotropy

YELLOW....gas, low velocity anisotropy

LIGHT GREEN ...gas, high clay

GREY...gas, high clay, low velocity anisotropy

WHITE...no gas

GOLD... no gas, low velocity anisotropy

GREEN... no gas, high clay

LINES

MAGENTA...lineaments

THICK MAGENTA... outline of higher lineament density

4 ATTRIBUTES

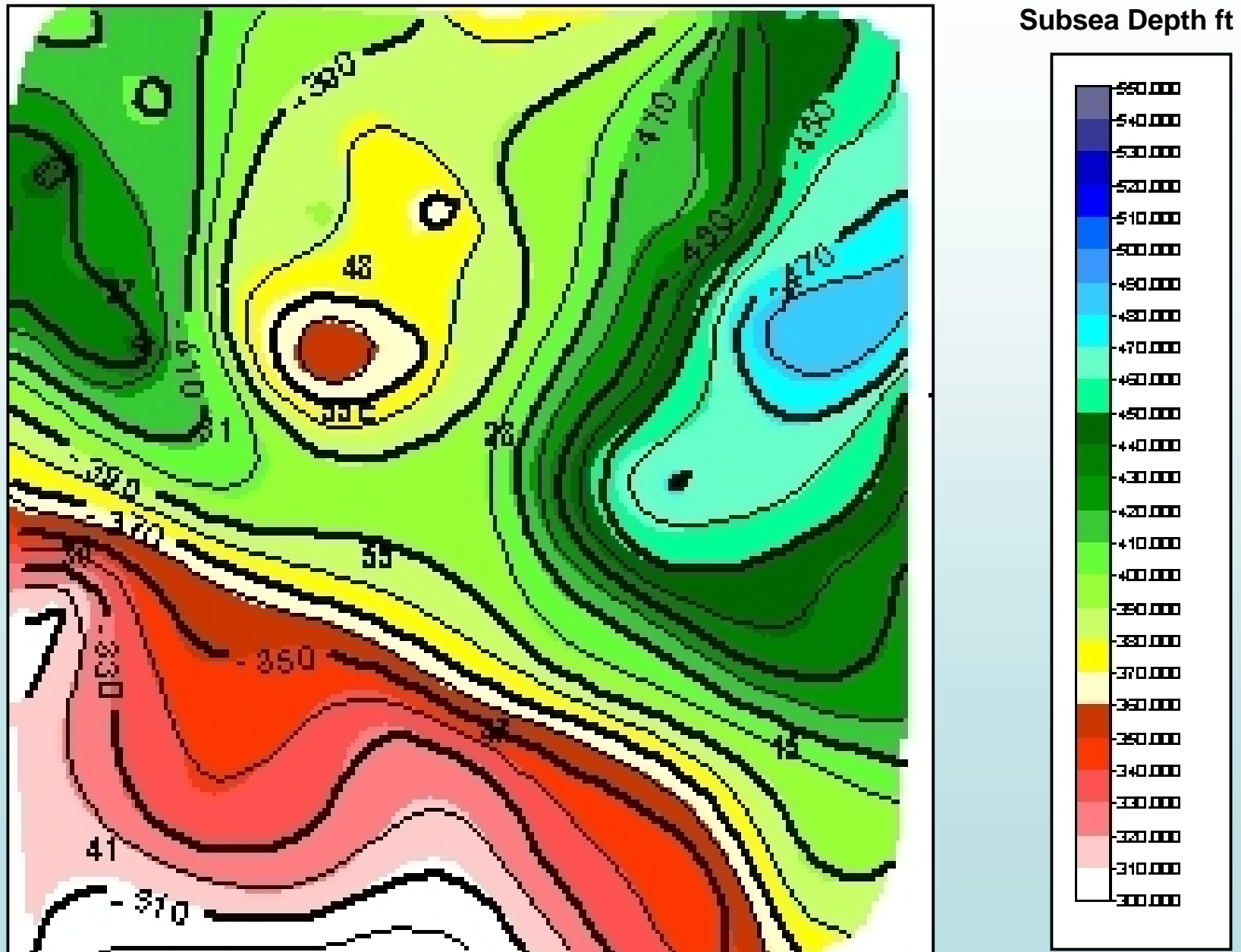
Clay Content Lineament Density

Velocity Anisotropy

Phase Difference

Gas Saturation

Lower Dakota Seismic Structure



President and Technical Manager James J. Reeves, Ph.D., P.E., P.G.

Dr. Reeves has his degrees from the Colorado School of Mines. He is a registered professional engineer in the State of Texas. Dr. Reeves' industry experience includes work with Gulf Oil Corporation and Pectin International Company as an Exploration Geophysicist. As an Assistant Professor of Geology at the University of Texas of the Permian Basin, he taught several courses on finite difference and finite element numerical modeling. He also conducted research in seismic data processing and interpretation of seismic data at UTPB, and as an Associate Research Professor for Texas Tech University. Dr. Reeves has served as a Principal Investigator for two Department of Energy studies focusing on the integration of geological, geophysical, and reservoir engineering data to optimize oil and gas production.



Vice President and Project Coordinator

W. Hoxie Smith, M.S.

Mr. Smith has over 20 years of industry experience, including 9 years with Atlantic Richfield Company (ARCO) and 4-years with Dawson Geophysical Company before co-founding GeoSpectrum Inc. He has managed several large industry reservoir projects and served as the Project Manager for an integrated reservoir characterization study conducted through the U.S. Department of Energy's Oil & Gas Program. Mr. Smith has been the featured speaker at numerous professional society meetings including national meetings of the Society of Exploration Geophysicists, American Association of Petroleum Geologists, and the Society of Petroleum Engineers. He received his B.S. degree in Geology from Colorado State University and his M.S. degree in Geology from the University of Texas of the Permian Basin.



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Inc.**

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The Reservoir Development Company...

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Integrated Reservoir Development Services

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Geostatistics

Integrated Results

"Citrix MetaFrame NFuse demo"